REMARKS

Reconsideration is respectfully solicited.

CLAIM AMENDMENT

Support for the amendment can be found in the description p.2, 1.34 - 36.

This amendment is intended to highlight the fact that, in our invention the bicarbonate is the main active constituent whereas the magnesium compound is a caking inhibitor *additive*.

CLAIM REJECTIONS - 35 USC §112

Applicants respectfully traverse the rejection of the claims with respect to the recitations μm. Claim 1 has been amended to correct the recitation. Moreover, Claim 1 has been amended to incorporate Claim 3; and Claim 3 has been canceled.

Applicants respectfully traverse the rejection of the claims with respect to the recitations of D90, D50, etc. The 2 additional enclosures for the record include a page Terence Allen's book entitled "Particle size Measurement", Second Edition, published by Chapman and Hall Ltd.(1975)[Enclosure 1] and a copy of a page from Ullmann's, Encyclopedia of Industrial Chemistry, Fifth Edition, Vol. A7, p. 160-161, 1986, editor Wolfgang GERHARTZ, publisher:VCH. The Examiner's attention is also directed to U.S. 6171567.

Applicants, by the undersigned, thanks the Examiner for the telephone conference on Friday August 30. The Examiner was of the view that Claim 13 referred to D90 in a way that was unclear. In applicants' version of Claim 13, the algebraic equation defining sigma, σ, is complete in terms of D_{10}, D_{50} and D_{90} and each of D_{10}, D_{50} and D_{90} are in fact defined in terms of a specific diameter.

These references tend to support the proposition that the given definition of D_{90} (D_{50} ....) is a classical implicit definition. The numerical value therefor can be directly read on standard

cumulative particle size distribution graph(s). Those graphs give, as a function of the diameter "d", the total percentage of particles whose diameter is less than "d" (see as an example in annex, fig. 4.3 from Terence ALLEN's book "Particle size Measurement"). To find the value of f.i. D_{50}, select the value 50 on the "Y" axis and read the corresponding value of D_{50} on the "X" axis.

Moreover, the reference, U.S. Patent No. 6,171,567B1, newly cited by the Examiner shows that very same proposition in the paragraph bridging columns 1 and 2. This patent recites a PCT publication date of 1995.

CLAIM REJECTIONS - 35 USC §103 and DOUBLE PATENTING

Because the content of German Patent Doc DE 4100645A1 to Regler [hereinafter 'Regler'] is a basis for each of the two referenced-based rejections it will be discussed first. Applicants respectfully traverse the rejection of Claims 1-10 and 12 under 35 U.S.C. 103(a) as unpatentable over German Patent Doc DE 4100645A1 to Regler [hereinafter 'Regler'] in view of WO 95/19835.

Applicants wish to stress the following points, relating to Regler:

- Regler's invention lies in the addition of *nitrogen containing compounds, in order to reduce the emission of nitrogen oxides*. This is not at all the subject of applicants' invention to basic alkali and/or alkaline earth compounds; and it is not particularly relevant to the object of the invention, which includes solving an agglutination problem, of sodium bicarbonate. Thus, a man skilled in the art who wants to solve an agglutination problem *would not look at the Regler's paper at all*!

- In applicants' invention the bicarbonate is the main active constituent whereas the magnesium compound is a caking inhibitor *additive*. This is emphasized in originally filed claim 3. To the contrary, in Regler, the alkaline earth compound can be the main or

only (and even *preferred*, see best mode in the example) active basic constituent for the gas purification.

- Concerning the embodiment where the caking inhibitor is lignite coke, one has to realize that lignite is a very particular coal, with the lowest calorific value (see Ullman's reference, in annex) which is different from *active* coal (see specification p.2, 1.30-33, which states that active charcoal is a **different** constituent).

- Regler's compositions comprise alkali and/*or* alkaline earth. The selection of sodium bicarbonate *and* a magnesium compound among 6 alkali and 4 alkaline earth (burned lime, calcium hydroxide, calcium carbonate and magnesium compound) amounts to the selection of two elements among a list of 10 elements, that is one among 90 (10 times 9). Moreover, Regler recommends adding a surface active substance, including one which is silica. The probability to **avoid** silica is 4/5, since silica is in a list of 5 elements. In summary, the reconstitution of the constituents of the invention through multiple selections in the 3 Regler's lists, amounts to a selection of one element in a hundred!

- In order to reconstitute the invention, starting from Regler, the skilled man would have had, after the selection of one-among a hundred of possibilities, to **modify the proportions** of the selected constituents of the composition. Indeed, in Regler, the magnesium compound is a (or even the) basic active substance for gas purification. In his only example, Regler discloses a composition consisting of calcium hydroxide only (which is in the same list as the magnesium compounds). To the contrary, according to the invention, the magnesium compound is an additive, in proportions of at most 10% in weight!

- The comparison of the applicants' specification examples 7 (in accordance with the invention) and 8 (not in accordance with the invention reveals the particularly interesting advantage of avoiding, according to the invention, the presence of silica. in the reactive composition.

- In conclusion, the Examiner's reasoning is a real *a posteriori* reconstruction of the invention. To the contrary, the complexity of the selections and modifications needed to reconstitute the claimed subject mater proves that the invention is *nonobvious* over Regler.

With respect to the PTO reliance on the Graham determinations, it is applicants' view, that the differences between the applied references are such that a person of ordinary skill would not look to the actual descriptions of the references and find the language of the rejected claims or the discovery of the problem recognized by applicants. Particularly, the applied references provide no motivation or expectation of success, with respect to the language of the rejected claims.

DOUBLE PATENTING

Applicants' respectfully traverse the obviousness-type double patenting rejection. Substantively, applicants note that the discussion above with respect to the non-obviousness of the invention over Regler, also moots the double patenting rejection.
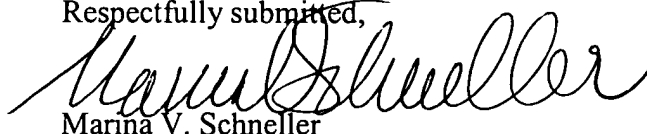
Legally, applicants' note the <u>Studiengesselschaft Kohle mbH v. Northern Petrochemical Co.</u> [228 USPQ 837 Fed.Cir. 1986]case precedent. In this case, the court held that claims to a product are not directed to the same invention as claims directed to a process of use, viz., "[B]ecause the two patents claim different statutory classes of subject matter, composition and

process, they are not the same invention. Studiengesselschaft Kohle mbH v. Northern

Petrochemical Co. [228 USPQ 837, at 840]"

In applicants' view combining two references which relate to inventions different from

each other and different from the claims at issue does not provide a **prima facie** grounds for

double patenting. Evidence of this is that the very composition which applicants' expressly seek

to exclude from the claims at issue could be used in a way to infringe the claims of the cited

patent [6171567B1].

Reconsideration and an early allowance are respectfully solicited..

Respectfully submitted,

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Sept 18 2002
Date

#402107

In re Patent Application of:

Applicants : Nilo FAGIOLINI et al.

Appln. No. : 09/423,746

Filed : November 15, 1999

For : REACTIVE POWDER COMPOSITION
AND METHOD FOR PURIFYING GAS

Atty. Dkt. : 32232-152197

MARKED UP VERSION OF CLAIM AMENDMENT

1. (FIVE times Amended) Solid pulverulent reactive composition for the purification of a gas, comprising <u>at least 90% by weight of</u> sodium bicarbonate and a caking inhibitor for sodium bicarbonate and being devoid of silica, said inhibitor comprising lignite coke and/or a magnesium compound selected from the group consisting of magnesium oxide, magnesium hydroxide, mixtures of magnesium oxide and magnesium hydroxide and magnesium hydroxycarbonate, wherein said composition exhibiting a mean particle size of less than 50[μ] μm and a particle size slope of less than 5 <u>and wherein said inhibitor is present in an amount by weight of greater than 0.5% of the weight of sodium bicarbonate.</u>
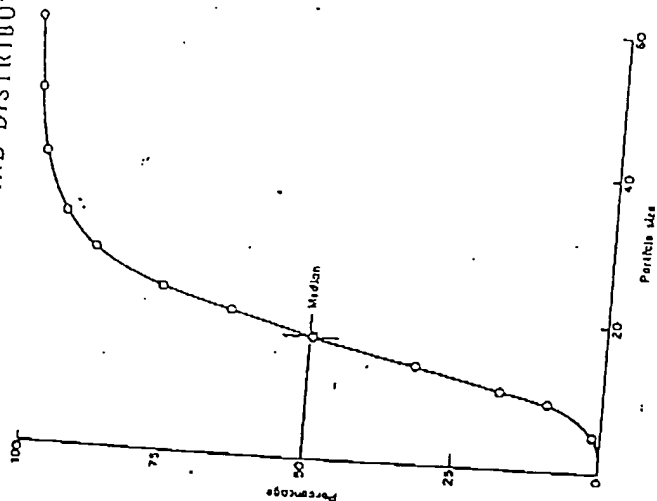
Enclosure 1

PARTICLE SIZE, SHAPE AND DISTRIBUTION

Fig. 4.3. The cumulative percentage frequency curve.

Table 4.8 (a) Cumulative percentage undersize distribution

Particle size (µm) x_2	Cumulative percentage undersize $\phi = \sum\limits_0^x d\phi$
5	1.4
9	9.4
11	18.0
14	32.0
17	49.5
20	64.0
23	76.0
28	88.0
33	94.0
41	98.0
50	99.4
60	99.9

ϕ, the frequency function $= \Sigma dN$ for a number distribution
$= \Sigma x\, dN$ for a size distribution
$= \Sigma x^2\, dN$ for an area distribution
$= \Sigma x^3\, dN$ for a volume or weight distribution where dN is the percentage of the total number of particles lying in the size range x_1 to x_2.
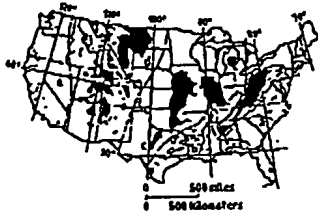
Table 4.8 (b) Relative percentage frequency distribution: tabular calculation of mean size.

Particle size range x_1 to x_2	Interval dx	Average size x	Percentage in range $d\phi$	Percentage per micrometre $d\phi/dx$	$x\,d\phi$
0 to 5	5	2.5	1.4	0.3	4
5 to 9	4	7.0	8.0	2.0	56
9 to 11	2	10.0	8.6	4.3	86
11 to 14	3	12.5	14.0	4.7	175
14 to 17	3	15.5	17.5	5.8	271
17 to 20	3	18.5	14.5	4.8	268
20 to 23	3	21.5	12.0	4.0	258
23 to 28	5	25.5	12.0	2.4	306
28 to 33	5	30.5	6.0	1.2	183
33 to 41	8	37.0	4.0	0.5	148
41 to 50	9	45.5	1.4	0.2	64
50 to 60	10	55.0	0.5	0.1	28

$$\text{Mean size} = \frac{\Sigma x\,d\phi}{\Sigma d\phi} = 18\cdot47$$

passes through the centre of gravity of a sheet of uniform thickness and density cut to the shape of the distribution. Hence, for the mean, the moment of the sum of all the elementary areas of thickness δx about the ordinate equals the sum of all the moments:

$$\bar{x}\sum \frac{d\phi}{dx}\,\delta x = \sum x\,\frac{d\phi}{dx}\,\delta x$$

$$\bar{x} = \frac{\Sigma x\,d\phi}{\Sigma d\phi} \qquad (4.13)$$

For a weight distribution $d\phi = x^3 dN$ giving:

$$\bar{x} = \frac{\Sigma x^4\, dN}{\Sigma x^3\, dN} \qquad (4.14)$$

The mode and the median may be determined graphically but the above summation has to be carried out for the determination of the mean. However, for slightly skewed distribution, the approximate relationship mean−mode = 3 (mean−median) holds. For a symmetrical distribution, they all coincide. In the illustration, the values are: mode = 15·0; median = 17·2; yielding mean = 18·2, as compared with the estimated value of 18·47 (table 4.8).

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Figure 1. Geographic location of the world's coal

Figure 2. Coal provinces of the conterminous United States
a) Eastern; b) Gulf; c) Interior; d) Northern Great Plains; e) Pacific Coast; f) Rocky Mountain

younger, these coals tend to be of lower rank, usually subbituminous, than the Carboniferous coals. Since the Cretaceous some coal has been deposited in scattered locations more or less continuously and tends to be lignite or brown coal.

The distribution of coal seams throughout the world is also not uniform. As shown in Figure 1, most of the world's coal is located in only three countries, the United States, the Soviet Union, and China. Although the figures vary from source to source, each of these countries has about 25 % of the total coal resources, while the rest of the world shares the remaining 25 %. In the United States, bituminous coal seams are concentrated in the Appalachian and Illinois Basins. Most of the subbituminous coal occurs in the various smaller basins in the Rocky Mountain region, and the lignite seams are concentrated in the northern Great Plains and the Gulf Coast area.

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4. Classification

Coal is combustible and should be composed of more than 50 wt% carbonaceous material [11]. Commercially, coal is classified in a number of ways on the basis of (1) the original plant or mineral composition, sometimes called coal type, (2) the degree of maturity or metamorphism, called coal rank, (3) the amount of impurities such as ash or sulfur, called coal grade, and (4) the industrial properties such as coking or agglomeration.

One of the main classifications by composition used by the United States Bureau of Mines is based on the relative amounts of petrographic entities detected in thin-section analysis, including anthraxylon (translucent material roughly equivalent to vitrinite), translucent attritus (roughly equivalent to liptinite), and opaque attritus and fusain (roughly equivalent to inertinite) [12], [13]. Under this system, coals are divided into two groups: banded coals, with > 5 % anthraxylon, and nonbanded coals, with < 5 % anthraxylon. The banded coals are subdivided into three types: bright coal, consisting mainly of anthraxylon and translucent attritus with < 20 % opaque matter; semisplint coal, consisting mainly of translucent and opaque attritus with 20–30 % opaque matter; and splint coal, consisting mainly of opaque attritus with > 30 % opaque matter. The nonbanded coals are divided into cannel coal, consisting of attritus with spores, and boghead coal, consisting of attritus with algae.

The various bands or layers in coal evident to the unaided eye have also been classified into four types [14]. Vitrain layers appear bright and vitreous; clarain appears as relatively less bright; minitated layers, durain is dull and featureless; and fusain layers are dull gray and like charcoal. Although these terms (all ending in -ain) are microscopic terms meant to be applied to hand specimen samples, they do have some compositional implications at the microscopic level. For example, vitrain layers contain mainly vitrinite macerals, fusain layers contain mainly inertinite macerals, and clarain and durain are mixtures of all three maceral types.

The most important classification for commercial purposes in the United States is the ASTM classification by rank. It is the basis on which most of the coal in the United States is bought and sold. This classification, ASTM Standard D 388 shown in Table 3, divides coal

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Table 3. Classification of coal by rank

Class	Group	Fixed carbon limits, % (dry, mineral-matter-free basis)		Volatile matter limits, % (dry, mineral-matter-free basis)		Calorific value limits, Btu/lb (moist, mineral-matter-free basis)		Agglomerating character
Anthracitic	metaanthracite	≥ 98	—	—	< 2	—	—	non-agglomerating
	anthracite	≥ 92	< 98	> 2	≤ 8	—	—	
	semianthracite	≥ 86	< 92	> 8	≤ 14	—	—	
Bituminous	low-volatile bituminous coal	≥ 78	< 86	> 14	≤ 22	—	—	commonly agglomerating
	medium-volatile bituminous coal	≥ 69	< 78	> 22	≤ 31	—	—	
	high-volatile A bituminous coal	—	< 69	> 31	—	≥ 14000	—	
	high-volatile B bituminous coal	—	—	—	—	≥ 13000	< 14000	
	high-volatile C bituminous coal	—	—	—	—	≥ 11500	< 13000	
		—	—	—	—	≥ 10500	< 11500	agglomerating
Subbituminous	subbituminous A coal	—	—	—	—	≥ 10500	< 11500	nonagglomerating
	subbituminous B coal	—	—	—	—	≥ 9500	< 10500	
	subbituminous C coal	—	—	—	—	≥ 8300	< 9500	
Lignitic	lignite A	—	—	—	—	≥ 6300	< 8300	
	lignite B	—	—	—	—	—	< 6300	

into 4 classes, anthracite, bituminous, subbituminous, and lignite, which are further subdivided into 13 groups on the basis of fixed carbon and volatile matter content, calorific value, and agglomerating character. The fixed carbon and volatile matter values are on a dry, mineral-matter basis and the calorific values are on a moist, mineral-matter-free basis. In this system, coals with ≥ 69 % fixed carbon are classified by fixed carbon content and those with < 69 % fixed carbon are classified by calorific value. Thus, all lignitic and subbituminous coals and the low-rank bituminous coals are classified by their calorific value. It is also important to note that not all coals can be fitted into this system. This is especially true of coals with a high liptinitic maceral content, such as cannel and boghead types.

The other important classification system is the international system of the ISO. In this system, coals are divided into two types: hard coals with greater than 23.86 MJ/kg (10 260 Btu/lb) and brown coals and lignites with calorific values less than that amount. In the hard coal classification shown in Table 4, the coals are divided

into classes, groups, and subgroups. The classes are similar to ASTM groups and based on dry, ash-free volatile matter. The classes are numbered as free calorific value. The classes are numbered as 0 to 9. The classes are divided into four groups, numbered 0 to 3 on the basis of the swelling properties (free-swelling index (p. 248), also called crucible swelling number, and Roga index). These groups are further broken down into six subgroups numbered 0–5 on the basis of their Audibert–Arnu dilatation number and Gray–King coke type. The system is set up in such a way that all coals are classified with a three-digit number, in which the first digit is the class, the second digit is the group, and the third digit is the subgroup.

The lignites and brown coals are only divided into classes and groups. The classes, numbered from 1 to 6, are based on ash-free moisture; the groups, based on dry, ash-free tar yield, are numbered from 0 to 4. This classification is shown in Table 5 (p. 163).

Although the ASTM and International Systems are different, there is a reasonable corre-